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Intermail and  
Commercial Mail Relay Services

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The Intermail and Commercial Mail Relay (CMR) programs forward electronic mail between the Internet and commercial systems such as Telemail, MCI Mail, and Dialcom. This report discusses the history and evolution of these systems and describes the present configuration. The problems encountered in operating a store-and-forward mail relay are also described. Current instructions for using Intermail and the CMR are provided as appendices.					
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# **INTERMAIL AND COMMERCIAL MAIL RELAY SERVICES**

Ann Westine, Annette DeSchon, Jon Postel, and Craig Ward

## **INTRODUCTION**

The evolution of large electronic mail systems testifies to the increasing importance of electronic mail as a means of communication and coordination throughout the scientific research community. These systems include the Internet mail system, the US Sprint Telemail system, the MCI Mail system, and the Dialcom systems. All of the systems were designed to operate autonomously, with no convenient mechanism to allow users of one system to send electronic mail to users on another system.

The Intermail and Commercial Mail Relay (CMR) services described in this paper were developed to provide a means for sending mail between the Internet and these commercial mail systems.

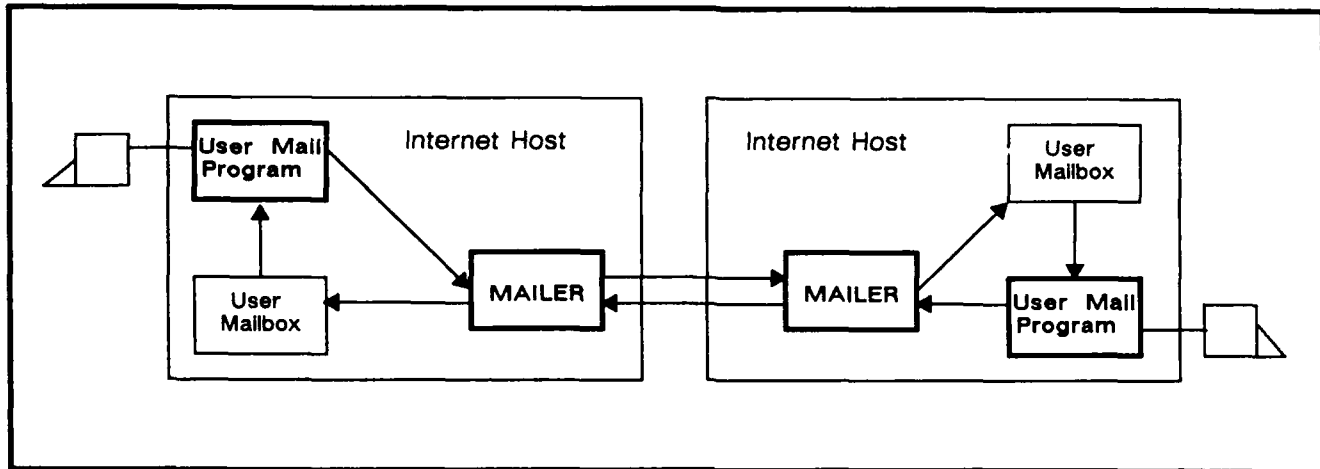
The Internet is an interconnected system of networks using the SMTP mail protocol, which includes the ARPANET, MILNET, NSFNET, and about 700 other networks; mail relays allow the exchange of mail with BITNET, CSNET, and the UUCP networks as well. To the users, this Internet looks like one large mail system with at least 100,000 computers and at least 400,000 users. Figure 1 illustrates the path of a message sent by a user on one Internet host to a user on another Internet host. For more details on the Internet and connected networks, see Appendix A.

As commercial mail systems came into popular use, it became clear that a mail link between the Internet and the commercial mail systems was necessary. More and more commercial and research entities needed to communicate with the Internet research community, and many of these organizations (for one reason or another) were inappropriate candidates for Internet sites. The Intermail and CMR services allow these groups to communicate with Internet users by purchasing electronic mail services from commercial companies.

## **INTERMAIL**

Intermail is an experimental mail forwarding system that allows users to send electronic mail across mail system boundaries. The use of Intermail is nearly transparent, in that users on each system are able to use their usual mail programs to prepare, send, and receive messages. No modifications to any of the mail programs

on any of the systems are required. However, users must put some extra addressing information at the beginning of the body of their messages.



**Figure 1 - Internet to Internet Mail**

The earliest version of Intermail was developed in 1981, by Jon Postel, Danny Cohen, Lee Richardson, and Joel Goldberg [1]. It ran on the TOPS-20 operating system and was used to forward VLSI chip specifications for the MOSIS project between the ARPANET and the Telemail system. The original addressing model used in this system was called "Source Route Forwarding". It was developed to handle situations in which a message might travel multiple hops before reaching its destination.

Later, in 1983, Annette DeSchon converted Intermail into a more general-purpose mail-forwarding system, supporting forwarding between the Internet mail system and three commercial mail systems: Telemail, MCI Mail, and Dialcom [3,4].

As it became apparent that the level of generality of Source Route Forwarding was not needed, and as Intermail gained acceptance among users, an easier approach to addressing was developed. The new addressing model is called "Simple Forwarding". This form of addressing, like Source Route Forwarding, appears at the beginning of the text of each message. It can be used to include various Internet mail header fields in addition to the standard "To" and "Cc" address fields. This format also allows the use of special address formats, such as U.S. postal addresses and TELEX addresses, which are supported by the MCI Mail system. The Intermail system performed partially automated error handling. Error messages were created by the Intermail program and were then either approved or corrected by a human postmaster.

Figure 2 illustrates the pathways between the user mailboxes in the commercial mail systems and the user mailboxes in the Internet via the Intermail accounts and program modules. Figure 3 shows the Intermail processing in more detail.

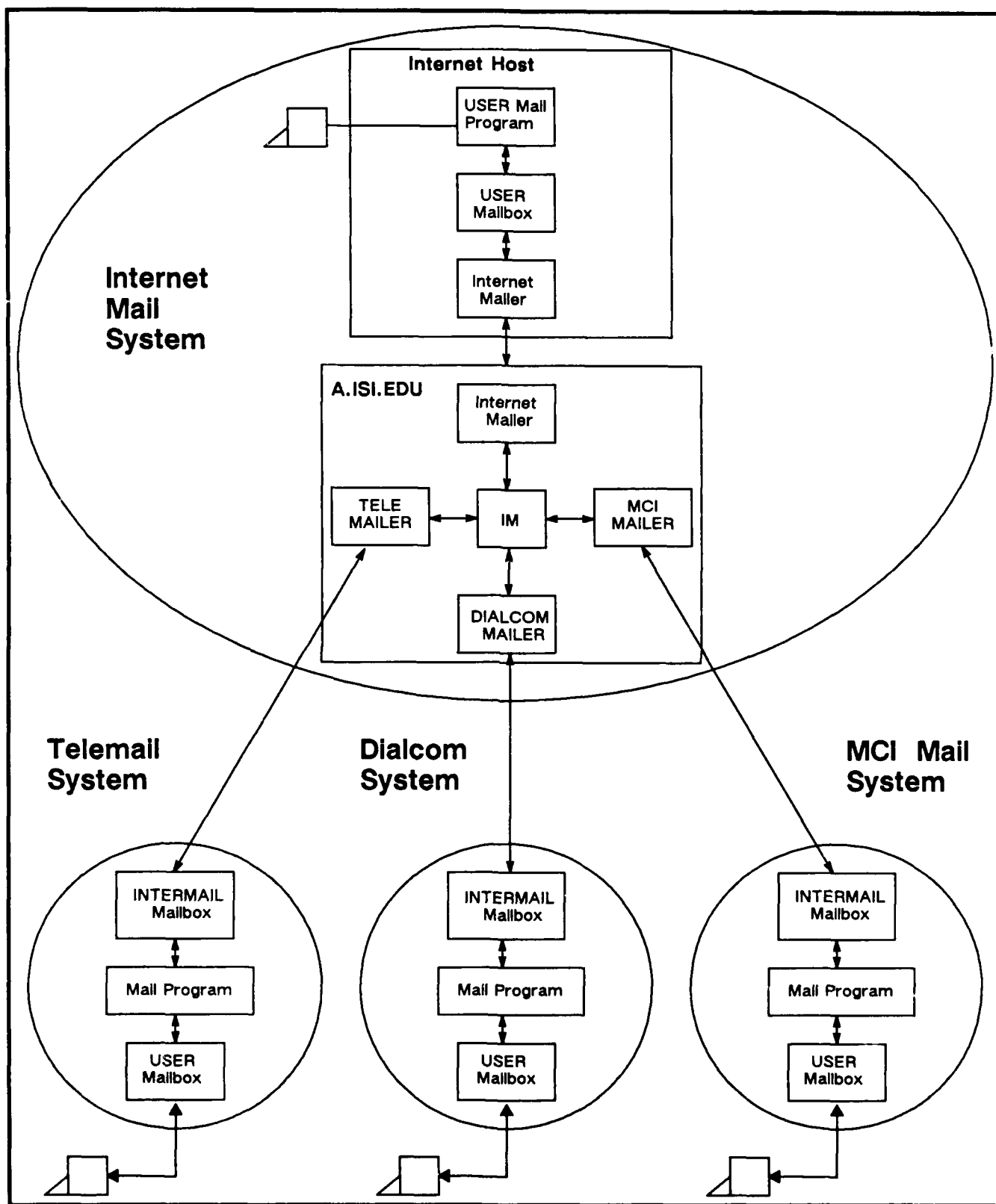


Figure 2 - Commercial Mail to Intermail

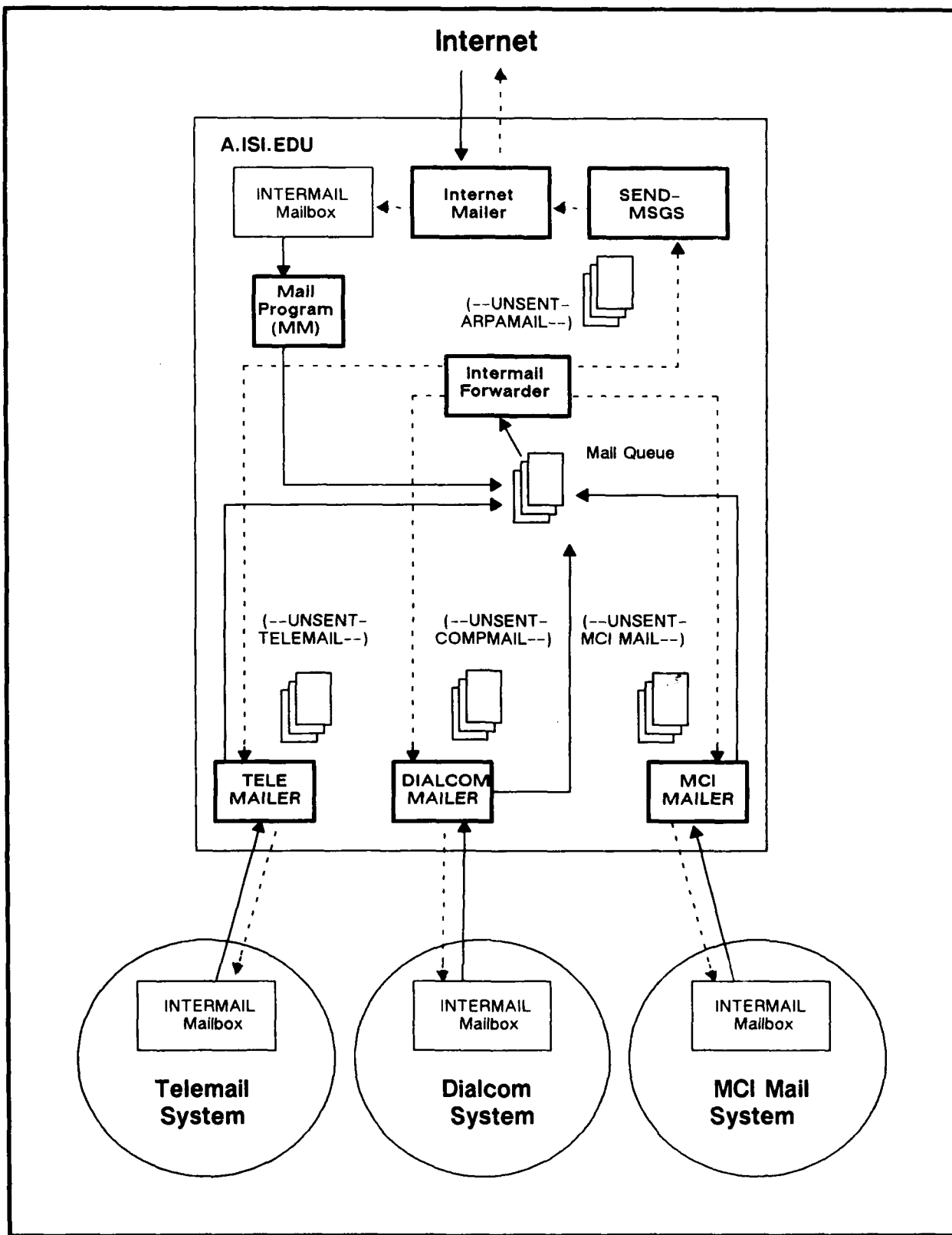


Figure 3 - Intermail Processing



## **COMMERCIAL MAIL RELAY**

In 1988, the Commercial Mail Relay (CMR) was developed to run on a dedicated UNIX system, replacing the TOPS-20-based Intermail system. The CMR is a store-and-forward mail link between the Internet and two commercial systems, Telemail and Dialcom. The only remaining forwarding performed by the TOPS-20 Intermail system is in support of the MCI Mail system. (This is planned for conversion to the CMR.) The CMR supports relay-style addressing in the "Internet to commercial system" direction, as well as Simple Forwarding in both directions. One advantage of relay-style addressing is that users from different commercial systems can appear on Internet mailing lists. Another advantage is that the reply features of most Internet user applications can be used by Internet users to respond to mail that originated on a commercial system. Unfortunately, since we do not have access to the address-parsing software on the commercial systems, it is not possible for users of the commercial systems to enter addresses directly into the message header, and they must continue to use Simple Forwarding.

The CMR supports automated error handling, which enables the system to provide faster turnaround on messages containing addressing errors, and requires much less intervention from a human postmaster.

## **DESCRIPTION OF THE CMR SYSTEM**

The Multi-channel Memo Distribution Facility (MMDF) is used as the system mail software because of its notion of separating the mail queue into separate channels [5]. This makes it easy to dedicate a channel/queue combination to each commercial system. Internet mail comes in over the standard SMTP port, and the system parses the destination address, queuing the message in the proper outgoing queue. A tag can be added to outgoing traffic so that replies can be made without any special processing at the destination site.

The CMR uses a relay mailbox on each commercial system. Commercial users send mail to this mailbox with a Simple Forwarding Header (SFH) at the head of their message text. Each channel, in addition to sending outgoing mail into the commercial system, reads all messages in the relay mailbox and places them in a spool file in the CMR host computer.

The processing of the spool file is performed by a single daemon. It parses each commercial system message header to find the sender and subject, then it searches for and processes the SFH. The SFH contains the destination Internet addresses.

The CMR employs a simple accounting mechanism: a shell script counts the number of times a string marker occurs in the MMDF logs. At the end of the month, another script uses an "awk" program to total the number of messages sent and received with

each commercial system. The Commercial Mail Relay is being developed by Craig E. Ward. Ann Westine served as the Postmaster for both Intermail and the CMR until March 1989. Currently our Action Office serves as Postmaster. Questions may be sent to "Intermail-Request@ISI.EDU".

## **COMMERCIAL SYSTEMS SERVED**

The CMR provides mail relay service between the Internet and two commercial electronic mail systems: the US Sprint Telemail system and the Dialcom system. A CMR connection to MCI Mail is under development. MCI Mail is currently served by the TOPS-20 Intermail system.

Telemail is an international commercial service. Some of the Telemail systems served by the CMR include MAIL/USA, NASAMAIL/USA, and GSFC/USA. Some government agencies, such as NASA and the Environmental Protection Agency, have dedicated Telemail systems. Companies also exist that purchase bulk services from Telemail and resell the service to individuals. Omnet's Sciencenet is a very popular example of this type of service.

Dialcom is a commercial service similar to Telemail in that it has facilities for allowing groups to purchase tailored services, and some government agencies (such as the National Science Foundation and the U.S. Department of Agriculture) have special group-access plans. The IEEE Computer Society also has a dedicated group service, called IEEE Compmail, which is open to members of the IEEE Computer Society.

MCI Mail is operated by MCI and is marketed to large companies as well as individual users.

Specific examples of the users of Intermail and the CMR are as follows:

1) Scientists in Oceanography, Astronomy, Geology, and Agriculture use Intermail and the CMR to communicate with colleagues. Many of these scientists have accounts on "Sciencenet", which is actually part of a Telemail system administered by Omnet.

(2) The IEEE Computer Society's publication editors use the Dialcom system "Compmail" to manage the papers being prepared for their numerous publications. Many of the authors are in university departments with access to the Internet. Intermail and the CMR support a significant exchange of large messages containing manuscripts.

(3) NASA uses Telemail systems for its own work and has extensive exchanges through its own relay service, as well as Intermail and the CMR, for communicating with university scientists on the Internet.

Figure 4a illustrates the path of mail from the Internet to the commercial systems. Note: MCI Mail is not yet implemented.

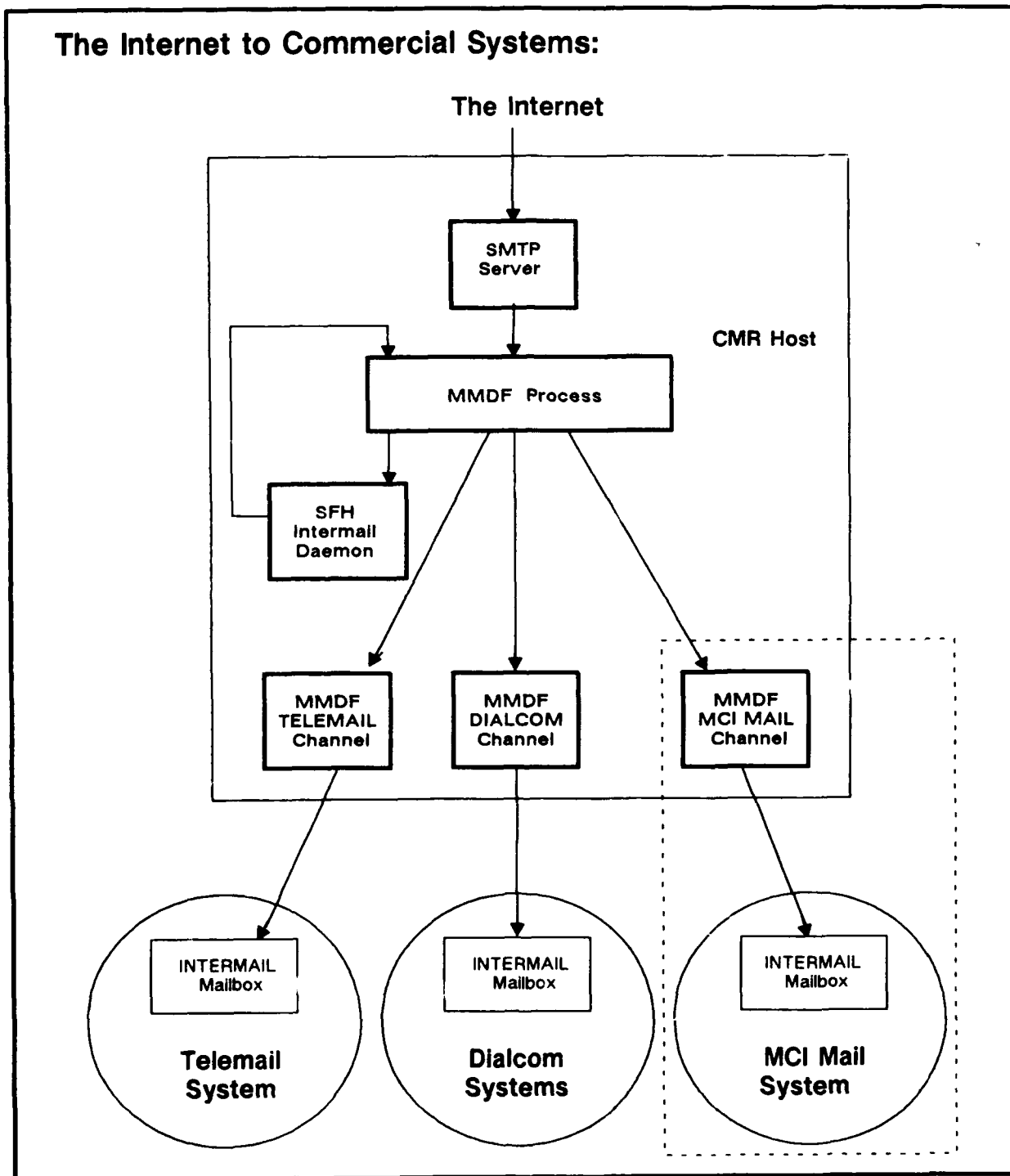


Figure 4a

Figure 4b illustrates the path from the commercial systems to the Internet. Note: MCI Mail is not yet implemented.

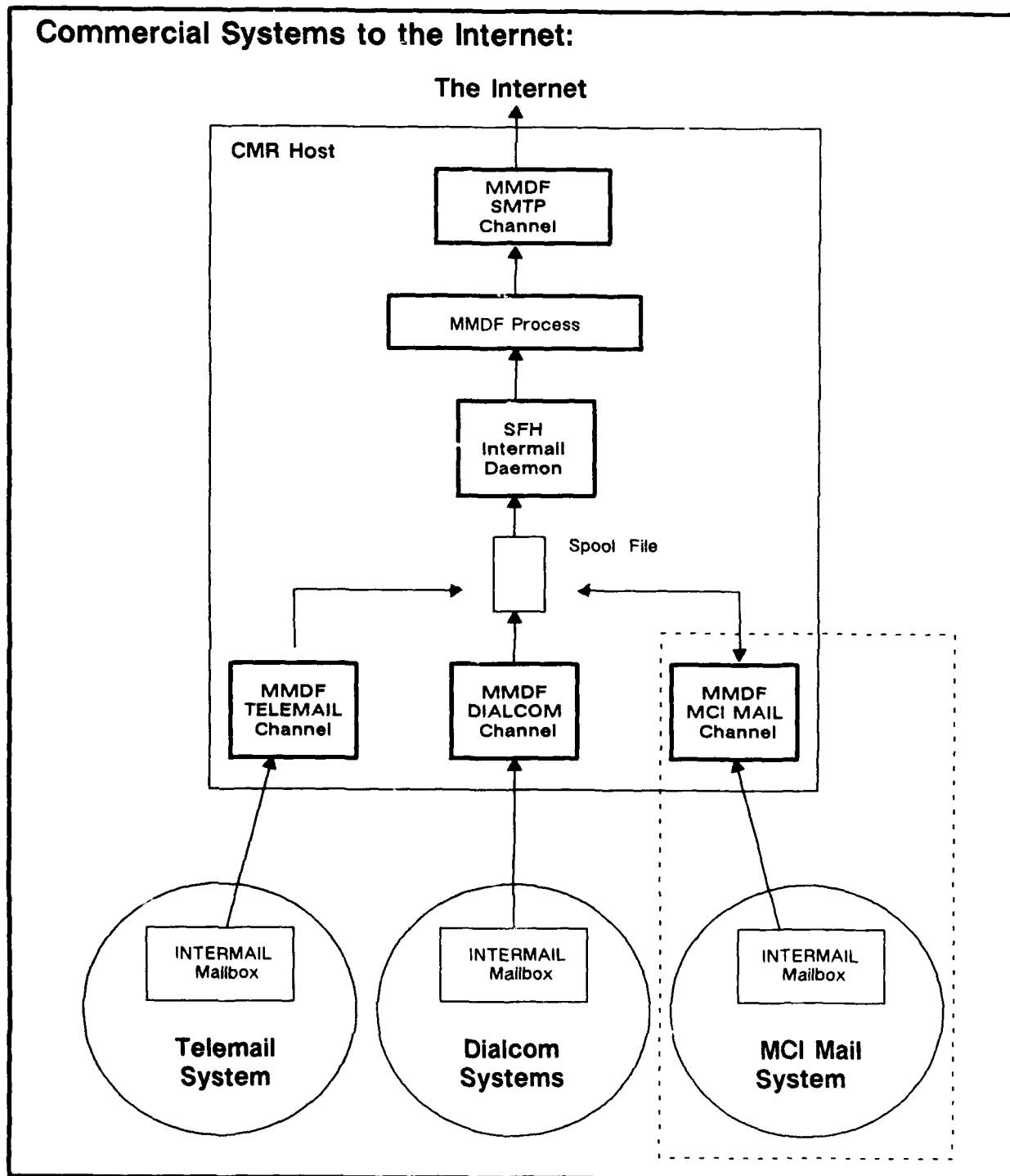


Figure 4b

## **ACCEPTABLE USE POLICY FOR INTERMAIL AND THE CMR**

The Internet is composed of many networks sponsored by many organizations. However, all the Internet's long-haul networks are provided by U.S. government agencies. Each of these agencies limits the use of the facilities it provides in some way. In general, the statement by an agency about how its facilities may be used is called an "Acceptable Use Policy".

The various agencies involved in the Internet are currently preparing their Acceptable Use Policy statements. Most of these are in draft form and have not been released as official agency statements as yet. None of these policies are currently available as online documents.

In the least restrictive case, all bona fide researchers and scholars, public and private, from the United States and foreign countries (unless denied access by national policy) are allowed access.

The Intermail and Commercial Mail Relay (CMR) systems at the University of Southern California Information Sciences Institute (ISI) are resources provided by the Defense Advanced Research Projects Agency (DARPA) for computing and communication. Use of these resources must be limited to DARPA-sponsored work or other approved government business (or must otherwise meet the acceptable use policy of DARPA), only.

However, DARPA, as a member of the Federal Research Internet Coordinating Committee (FRICC), has agreed to the FRICC draft policy for communication networks, which provides in part that: "The member agencies of the FRICC agree to carry all traffic that meets the Acceptable Use Policy of the originating member agency".

Thus, e-mail messages (i.e., "traffic") that meet the Acceptable Use Policy of an agency and pass through some facility of that agency (i.e., "the originating member") on the way to Intermail or CMR are allowed.

The current member agencies of the FRICC are DARPA, NSF, DOE, NASA, and NIH.

BITNET and UUCP (and other) networks are interconnected to the Internet via mail relays. It is the responsibility of the managers of these mail relays to ensure that the e-mail messages ("traffic") that enter the Internet via their mail relays meet the Acceptable Use Policy of the member agency providing the Internet access.

In addition, we cannot allow CMR or Intermail to be used simply as a bridge between two commercial systems, even though CMR has this technical capability. At least one end of the communication must be related to FRICC acceptable use.

## DETAILS OF CMR SYSTEM USE

The CMR host computer is Internet host INTERMAIL.ISI.EDU (128.9.2.203). The users of the commercials system are required to know the proper gateways between the Internet and other networks such as BITNET, CSNET, or UUCP. Users on networks interconnected to the Internet likewise need to know how to reach the Internet to send mail through INTERMAIL.ISI.EDU to a commercial system.

The relay connection to Telemail is through their host TELEMAL/USA. The general syntax for Telemail addresses is "[USER/ORGANIZATION]HOST/COUNTRY", making the full address for the relay mailbox:

[INTERMAIL/USCISI]TELEMAL/USA

Users across the entire Telemail service can send mail to this address. Users on the TELEMAL host need only send to INTERMAIL.

Internet users can use the basic Telemail format, append a "%TELEMAL" to it, and mail to the resulting address as if it really existed on INTERMAIL.ISI.EDU, e.g.:

[CWARD/USCISI]TELEMAL/USA%TELEMAL@INTERMAIL.ISI.EDU

Note that the CMR system will accept anything before the "%TELEMAL", that is, the CMR does not validate Telemail addresses before transmitting them to Telemail.

The CMR handles Dialcom mail delivery in a similar way, but this system has what might be called "virtual hosts". Groups can be set up with an alias system to allow easier intra-group access. For example, both NSF and USDA share the same Dialcom host (157); but, while both groups send relay messages to Intermail, their actual fully qualified Dialcom mailboxes are different. For example, NSF's mailbox is NSF153, and USDA's mailbox is AGS9999.

Mail going in either direction may use an embedded Simple Forwarding Header. An SFH *must* be the first part of the message text. It starts with a "Forward:" field followed by a "To:" field. "Cc:", "Subject:", and other fields may follow the "To:" fields. The SFH is terminated by a blank line.

This is a template of an SFH:

Forward: Destination-Network  
To: User@host1, User@host2,  
User2@host2  
Cc: User@host1  
Subject: This subject supercedes the subject in the host net header  
<Blank-Line>

Dialcom syntax is "Host-ID:User-ID", for example, 134:ABC1234. This format will work from any Dialcom host; but users in the same group as ABC would be able to use the user name, for example, JSMITH.

Using the SFH format, mail to a Dialcom system could be sent as follows:

To: Intermail@ISI.EDU  
Subject: Test Message

Forward: Compmail  
To: 134:ABC1234

Here is the text of the message.

Proper destination network names include ARPA, Telemail, Compmail, NSF-Mail, and USDA-Mail.

It is possible for a user to make mistakes at many points in the process. Errors are handled as automatically as possible by the CMR. Many errors are caught in the standard Internet mail traffic, and users receive the usual error messages from the system. Messages with incorrect commercial system addresses or faulty SFHs are also automatically returned to sender. Messages that the software cannot handle are sent to the CMR's user-service mailbox, Intermail-Request@ISI.EDU. This mailbox has been set up to take care of user problems and to be a central distribution point for user instructions.

Note: Appendix D, E, and F located in the back of this document, are the current instructions sent online by Intermail-Request, to individuals inquiring about CMR.

## PROBLEMS

Several problems arise from the store-and-forward nature of the CMR. One of the biggest is that almost all of the commercial systems lack a machine-to-machine interface -- the CMR software must mimic a human user of the commercial system. Another problem is that the Internet and a commercial system have different forms (or syntax) for electronic mail addresses. A major goal of the CMR project is to make the link between networks as transparent as possible, allowing Internet users to use off-the-shelf mail programs. Making commercial address formats fit the Internet standard is a major task [2].

Compatibility with Internet addressing standards is also a concern. The commercial accounts are not able to take advantage of the transparency features of the Domain Name System (DNS) (see Appendix B); and some commercial addresses are incompatible with the Internet syntax--this requires Internet users to continue using the older methods.

Another general problem to be solved is to reduce the amount of time needed to maintain the system. Because most commercial systems force our software to mimic a human user, automatic error detection and handling are quite complex. The Intermail system requires human intervention in processing failed mail. A goal of the CMR is to fully automate these processes.

A related problem facing the CMR, as well as its predecessor Intermail, is the frequency with which commercial systems change their software. The changes are usually minor and do not bother most human users; however, the CMR depends on being able to recognize certain strings. To avoid the necessity of rebuilding the whole CMR when these strings change, most of the string markers are stored in ASCII files that are read at run time.

The translation of commercial system addresses has created a new set of problems, most of which are caused by the use of "special" characters by the commercial systems.

Telemail uses square brackets ("[" and "]") around user names. While these characters are not special by Internet standards when found in the local part of an address, many (perhaps most) Internet mailers refuse to accept these characters unless they are quoted. MMDF was modified locally to correct this.

The square bracket problem is even worse for users of IBM mainframe machines, many of which are used on BITNET. The square bracket is not a printable character on many BITNET IBM hosts, and all kinds of strange addresses can result from its use.



The colon is another example. Dialcom uses it as the delimiter between host and mailbox. However, the colon is a special character in the Internet mail standard [2]. Users can avoid this problem by using the SFH and placing the Dialcom address at the beginning of the message text. Although the CMR can accept addresses with colons, many Internet hosts and relays are unable to accept addresses that contain colons. Mail with colons in the address fields is often rejected by Internet hosts and is returned to the Intermail-Request mailbox for error processing. This can cause significant delays.

Problems have also been caused by confusion about which hosts are mail relays between the Internet and other systems compatible with the Internet mail standard [2]. (e.g., BITNET, UUCP, and CSNET). When the CMR was implemented, a decision was made that the CMR would not keep track of these mail relays. When a relay is changed, as the BITNET mail relays were in 1988, mail may be rejected because the host either no longer exists or refuses the mail.

The mail relay problem is a subset of the larger problem of communicating information about new features and changes to the user community. Virtually none of the users of the CMR are local. Many are hidden behind the veil of the commercial system. (Dealing with commercial system customer support people has proven to be frustrating -- few of them seem to understand the concept of machine-to-machine exchanges.) Enhancements to commercial software that necessitate minor changes can disrupt some CMR users for days.

Another problem that has not been adequately solved is validation of commercial system addresses and processing of failed commercial system mail. The Telemail system will not validate a user/host combination until after the full text of the message has been transmitted. If a long message is sent to an invalid address, it can be very expensive in terms of wasted time and connect charges.

Telemail also gives inadequate information when the host is correct but the user name is not. The failed mail notice received from Telemail is of little use to either a human reader or the CMR software. The only information that Telemail returns is the message ID number -- it provides no subject, and no text to distinguish the message from the numerous others that pass through the mailbox.

Dialcom does a better job of validating addresses. If an address is not recognized, the system immediately prompts for a correction. A simple <RETURN> will delete the invalid address from the list.

The commercial systems are geared for paying customers to send and receive mail to other paying customers. They are not equipped to handle reverse billing, or "collect calls." ISI is currently charged for connect time needed to transmit and receive mail

to and from other Internet sites. A possible solution to this problem would be to extend the CMR. to include accounting and billing procedures that would pass the costs of CMR to its users.

For a list of known problems or bugs in the CMR software, see the Appendix of the program logic manual [6].

## **FUTURE DIRECTIONS**

No software project is ever completed, and the CMR is no exception. There are many possible extensions, some more difficult than others.

One addition that will be made to the CMR is a channel for interacting with MCI Mail. MCI Mail is one of the original TOPS-20 commercial systems that were serviced by Intermail; the CMR will need to replace this function before all of the TOPS-20 machines are removed from service on the Internet.

The adaptability of the CMR is such that adding new commercial systems should not be a major problem. Additional commercial systems under consideration include General Electric's GENIE, Western Union's EasyLink, and Compuserve.

One possible addition to the CMR system could be maintenance of a list of gateways. This would allow commercial system users to incorporate the native address formats of other networks into the SFHs. An advantage of this would be that users could simply tell the CMR to forward a message to BITNET, for example, and the CMR would find the gateway and properly format the address for that gateway.

To increase the ease of use to Internet users, the system might treat each commercial system as an Internet host and create DNS database records for them. This would allow users to send mail to a non-Internet user at an Internet-style domain name.

Another improvement would be the possibility of accepting X.400-style addressing. The current system rejects them.

In order to further reduce the hazards of string changes in the commercial system software, an AI component could be added to the commercial system interfaces. Such an AI component might be able to "figure out" what marker a new prompt represents and to remember it.

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## **APPENDIX A**

### **The Internet and Connected Networks**

The Internet is a network of networks interconnected by gateways or routers. The common element is the TCP/IP protocol suite. The Internet now includes approximately 800 networks and 100,000 host computers. The Internet is made up of local area networks in research institutes and university campuses, regional networks, and long-haul networks. These resources are supported by the using organizations and by several US government agencies (including DARPA, NSF, NASA, DOE, and NIH). The long-haul networks in the Internet are the ARPANET, the MILNET, the NSFNET Backbone, the NASA Science Internet (NSI), and the DOE Energy Science Network (ESNET).

Other systems using TCP/IP or other protocols may be networks of networks or "internets" with a lower case "i". The capital "I" Internet is the one described above.

There are other networks with (semi-) compatible electronic mail systems. These include BITNET (and EARN and NETNORTH), UUCP (and EUNET), CSNET, ACSNET, and JANET. Users of electronic mail may not necessarily be aware of the boundaries between these systems and the Internet.

The Domain Name System (DNS) is a mechanism used in the Internet for translating names of host computers into addresses. The DNS also allows host computers not directly on the Internet to have registered names in the same style.

#### **BITNET (Because It's Time NETwork)**

BITNET has about 2,500 host computers, primarily at universities, in many countries. It is managed by EDUCOM, which provides administrative support and information services. There are three main constituents of the network: BITNET in the United States and Mexico, NETNORTH in Canada, and EARN in Europe. There are also AsiaNet, in Japan, and connections in South America. Gateways exist between BITNET and the Internet. The most common gateway used is CUNYVM.CUNY.EDU.

#### **CSNET (The Computer + Science Network)**

CSNET has 180 member organizations, primarily computer science research laboratories at universities and research institutes, including international affiliates in more than a dozen countries. CSNET has adopted DNS-style names for all its host computers. It is administered by the University Corporation for Atmospheric Research (UCAR) and provides administrative support and information services via the CSNET Information Center (CIC) at Bolt Beranek and Newman (BBN). The gateway between CSNET and the Internet is RELAY.CS.NET.

Note: CSNET and BITNET have officially merged into a single organization as of October 1, 1989.

### **UUCP (UNIX to UNIX Copy)**

UUCP is a protocol, a set of files, and a set of commands for copying data files from one UNIX machine to another. These procedures are widely used to implement a hop-by-hop electronic mail system. This simple mechanism allows any UNIX host computer to join the system by arranging a connection (dial-up or permanent) with any UNIX host already in the system. In the basic UUCP system, mail is source routed by the sending user through a path of connected hosts to the destination. Currently, there are databases of connection information (UUCP maps) and programs (pathalias) that aid in determining routes. There is some use of DNS-style names by UUCP hosts. EUNET is a UUCP-based network in Europe, and JUNET is a similar net in Japan. These international branches of UUCP use DNS-style names as well. There are many hosts that may relay mail between UUCP and the Internet. One prominent gateway is UUNET.UU.NET.

### **JANET (Joint Academic NETWORK)**

JANET is the primary academic network in the United Kingdom, linking about 1,000 computers at about 100 universities and research institutes. JANET has a domain name system similar to that of the Internet, but the order of the domain name parts is opposite (with the top-level domain on the left). The protocols used in JANET are the UK "Coloured Books". The primary gateway between JANET and the Internet is NSFNET-RELAY.AC.UK.

### **ACSNET (Australian Computer Science Network)**

ACSNET is the principal electronic mail system for the computer science and academic research community in Australia, connecting about 300 sites. It works similarly to UUCP. ACSNET has a domain naming syntax similar to that for Internet domains. The gateways between ACSNET and the Internet are MUNNARI.OZ.AU and UUNET.UU.NET.

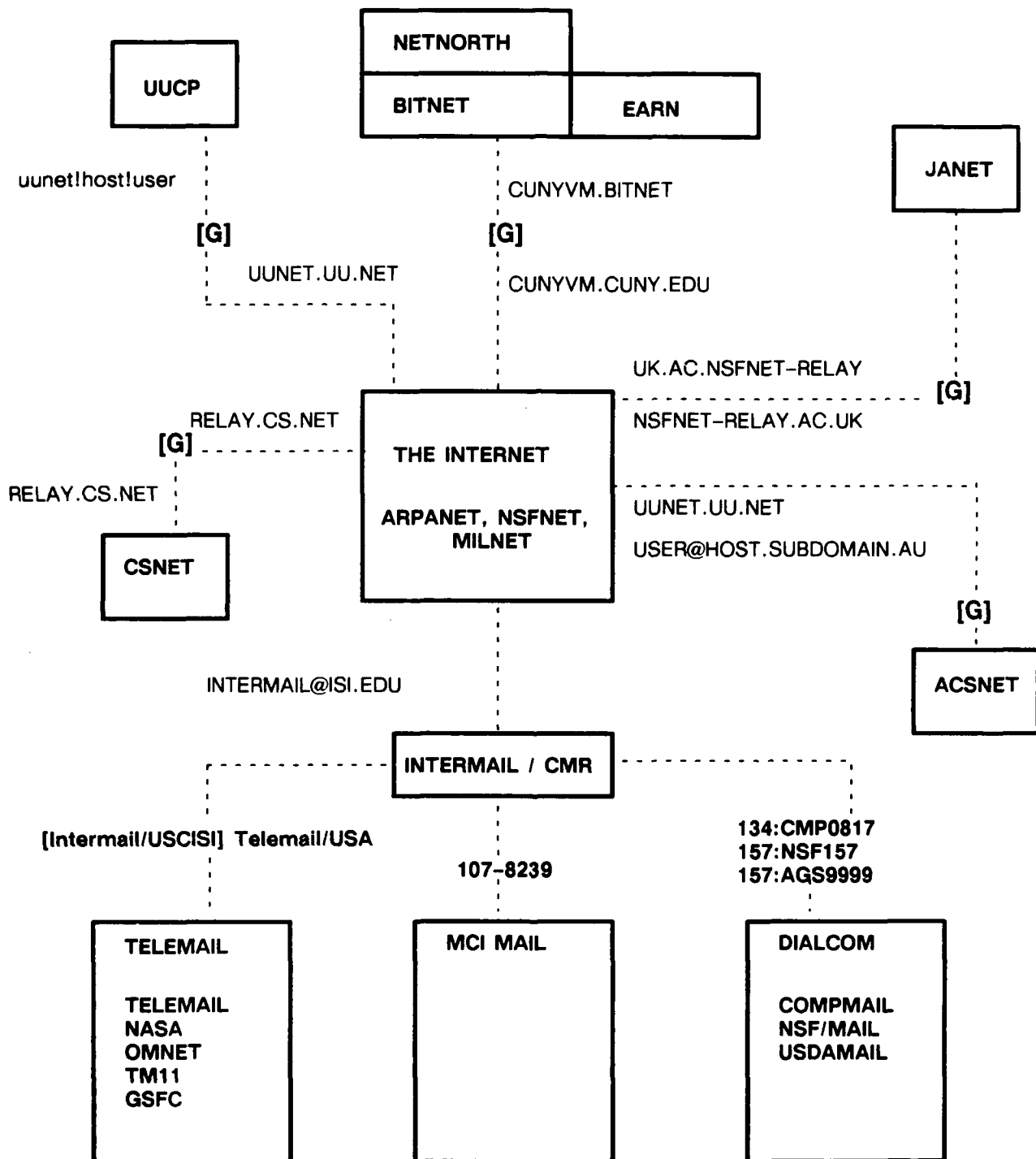
## **APPENDIX B**

### **The Domain Name System**

The Domain Name System (DNS) provides for the translation between host names and addresses. Within the Internet, this means translating from a name, such as "ABC.ISI.EDU", to an IP address such as "128.9.0.123". The DNS is a set of protocols and databases. The protocols define the syntax and semantics for a query language to ask questions about information located by DNS-style names. The databases are distributed and replicated. There is no dependence on a single central server, and each part of the database is provided in at least two servers.

In addition to translating names to addresses for hosts that are in the Internet, the DNS provides for registering DNS-style names for other hosts reachable (via electronic mail) through gateways or mail relays. The records for such name registration point to an Internet host (one with an IP address) that acts as a mail forwarder for the registered host. For example, the Australian host "YARRA.OZ.AU" is registered in the DNS with a pointer to the mail relay "UUNET.UU.NET". This gives electronic mail users a uniform mail addressing syntax and avoids making them aware of the underlying network boundaries.

# APPENDIX C - MAIL SYSTEMS MAP







## APPENDIX D

TELEMAIL

Ann Westine  
ISI  
March 1990

### MAIL FORWARDING BETWEEN TELEMAIL AND THE INTERNET USING COMMERCIAL MAIL RELAY (CMR)

#### OVERVIEW

These are the instructions for using the Commercial Mail Relay (CMR) system that has replaced the Intermail system. The CMR is used for transmitting computer mail between the Internet ARPA-Mail system and users on the Telemail system. CMR may be used in either direction.

\*\*\*\*\*

Please note: The use of DARPA-supported facilities is for DARPA-sponsored research activities and other approved government business.

\*\*\*\*\*

The CMR supports relay-style addressing in the Internet-to-Commercial system direction, as well as Simple Forwarding in both directions.

Messages to be forwarded are sent to the CMR mailbox on the local mail system. The CMR operates a program to service mailboxes in both the local and the destination mail systems. When the right forwarding information is supplied, either in the ARPA-Mail header "To:" field or at the beginning of a message, the program forwards those messages to the other mail system and on to the appropriate mailbox(es).

The CMR mailbox is called "Intermail@INTERMAIL.ISI.EDU" on ARPA-Mail and "[INTERMAIL/USCISI]TELEMAIL/USA" on Telemail.

To send a message from ARPA-Mail to a mailbox on a Telemail system, use the Internet Relay-Style addressing format. Simply type the Telemail mailbox in the "To:" field of the Internet header.

To:user-mailbox%TELEMAIL@INTERMAIL.ISI.EDU  
(for TELEMAIL/USA system only)

To:[user-mailbox/org]system\_branch/country%telemail@INTERMAIL.ISI.EDU  
(for all other Telemail systems)

The CMR also supports Simple Forwarding in both directions. Use the following form:

Forward: <mail system>  
To: <user mailbox>  
<blank line>

When forwarding mail to the ARPA-Mail system, you may use any acceptable Internet address (user@host.domain) in the "To:" field. If you are sending mail to more than one recipient, separate the addresses by commas. It is also possible to include "Cc:" recipients (see Example 1, below). When forwarding mail to the Telemail system, you must use the Telemail mailbox in the "To:" field.

In either direction, the local "Subject:" field of the message to the CMR is used as the "Subject:" field of the message delivered to the other mail system.

#### **TELEMAIL TO ARPA-MAIL USING SIMPLE FORWARDING**

The following is an example of how to send a message to "Intermail-Request", our user-service mailbox, with copies going to John on BITNET, and Fred on UUCP. First send a message to the CMR mailbox in Telemail called "[INTERMAIL/USCISI]TELEMAIL/USA". Then add the ARPA forwarding information at the beginning of the text of the message. A typical internet address is in the form (user@host.domain). Addresses are separated by commas (spaces are not sufficient). Note: when sending mail to BITNET or UUCP, you must type "Forward: ARPA", not "Forward: BITNET" or "Forward: UUCP".

Example 1-----

To: [INTERMAIL/USCISI]TELEMAIL/USA

Subject: Test Message Number 1

Forward: ARPA

To: Intermail-Request@INTERMAIL.ISI.EDU

Cc: JOHN%ABC.BITNET@CUNYVM.CUNY.EDU,  
bar!fred@UUNET.UU.NET

Hi Chloe,

This is the text of the test message.

--Fred

-----

"Forward: ARPA" signals the beginning of the forwarding information and tells the forwarding program that this message should be sent to the ARPA-Internet system. On the next line, "To: Intermail-Request@INTERMAIL.ISI.EDU" specifies the mailbox that the message will be delivered to. The "To:" line is required for delivery of the message.

Note that in the forwarding information section, the "To:" and "Cc:" fields must start at the beginning of the line. Continuation lines of the "To:" and "Cc:" fields, must be indented. The "To:" and "Cc:" fields may contain any address that ARPA-Mail allows. A blank line separates the forwarding information from the rest of the text. Therefore, do not insert any blank lines between the "Forward:" line and the "To:" line. The "Subject:" field from the Dialcom header will also be used as the subject in the ARPA-Mail header, when the message is forwarded.

Telemail users please note that forwarding information **MUST** be included in the text of the message, even when the "ANSWER" command is being used.

### **SENDING MAIL TO BITNET OR UUCP NETWORKS**

BITNET and UUCP are networks with mail systems that are (semi) compatible with the Internet. They (and other networks) are connected to the Internet by host computers called mail gateways. To send mail to someone on one of these networks, you must know the recipient's electronic address and also the name of the host that acts as a gateway between that network and the Internet. For example, to send a message to John at ABC host on BITNET, you must send it via the BITNET gateway CUNYVM.CUNY.EDU. Note: You must modify the BITNET address when you use a gateway; replace the "@" sign in the BITNET address with "%". The correct address is shown below:

JOHN%ABC.BITNET@CUNYVM.CUNY.EDU

To send a message to fred at BAR host on UUCP, send it via the UUCP gateway UUNET.UU.NET. The correct address is as follows:

bar!fred@UUNET.UU.NET

### **ARPA-MAIL TO TELEMAL USING RELAY-STYLE ADDRESSING**

In this direction, you can type the Telemail mailbox in the "To:" field of the standard Internet header of your mail program, for example,

To: WORTH/XYZ-INC%TELEMAL@INTERMAIL.ISI.EDU

To send a message to a mailbox on a different TELENET system (for example, to a user at OMNET, on the MAIL/USA system), use the following format:

To: [Gordon/OMNET]MAIL/USA%TELEMAIL@INTERMAIL.ISI.EDU

Please note that in some mail interfaces, you may need to quote the string before the at-sign. For example:

To: "[Gordon/OMNET]MAIL/USA%TELEMAIL"@INTERMAIL.ISI.EDU

In the sample address above, everything to the left of "%TELEMAIL" is the user mailbox. Everything to the right of the "%TELEMAIL" is the ARPA-Mail forwarding information. The string "%TELEMAIL" must be included in each address so that the program can queue the message for Telemail. Be sure that there are no blank spaces anywhere in the address. Note that addresses are separated by commas.

The "Subject:" field from the ARPA-Mail header will be used as the subject in the Telemail header, when the message is forwarded.

In the following example, a message is being forwarded from the ARPA-Mail system to mailboxes on several TELENET mail systems: TELEMAIL, MAIL, GSFC, and NASAMAIL. The five recipients of the message are Washington, Gordon, Joe, Webster, and Glenn.

Example 2-----

To: Washington/XYZ-INC%TELEMAIL@INTERMAIL.ISI.EDU,  
[Gordon/OMNET]MAIL/USA%TELEMAIL@INTERMAIL.ISI.EDU,  
[Joe/EDUNET]MAIL/USA%TELEMAIL@INTERMAIL.ISI.EDU,  
[Webster/GSFCMAIL]GSFC/USA%TELEMAIL@INTERMAIL.ISI.EDU,  
[Glenn/NASA]NASAMAIL/USA%TELEMAIL@INTERMAIL.ISI.EDU,

Subject: Test Message Number 2

Fred,

This is a test of mail forwarding.

--Joe

-----  
It is possible to communicate with a number of organizations using Telemail systems in other countries, as well as the United States. The basic format is: [username/organization]system branch/country. Several Telenet systems have

converted to X.400 addressing. Unfortunately, CMR is not able to handle X.400 addressing, and cannot relay mail to and from these destinations.

### **BITNET USERS**

Some systems in the BITNET world treat square brackets, "[" and "]", as special characters. On these systems, a square bracket that is used in an address must be quoted through the use of a preceding backslash, "\". For example:

TO: \[GORDON/OMNET\]MAIL/USA%TELEMAIL@INTERMAIL.ISI.EDU

Many gateways still cannot handle this quote procedure properly. If relay-style addressing doesn't work for you, use the Simple Forwarding Header method, listed below. Backslashes should not be necessary.

### **ARPA-MAIL TO TELEMAIL USING SIMPLE FORWARDING**

In this direction, the Internet user must first send mail to the CMR mailbox on the Internet, "Intermail@INTERMAIL.ISI.EDU". Next, add the TELEMAIL forwarding information at the beginning of the message.

For example, to forward a message to Mary Worth on the TELEMAIL/USA system, the forwarding information would look like this:

Forward: TELEMAIL  
To: Worth/XYZ-INC  
<blank line>

To forward a message to Gordon at OMNET on the MAIL/USA system, use the following forwarding information:

Forward: TELEMAIL  
To: [GORDON/OMNET]MAIL/USA  
<blank line>

The following is an example of a message to be forwarded from the ARPA-Mail system to Telemail. Note that in the forwarding information section, the "To:" field must start at the beginning of the line. Continuation lines, for these fields must be indented. The "To:" field can contain any address that Telemail allows. All addresses are separated by commas, (do not use spaces). In the "To:" field of our example, the message is being sent to three mailboxes Worth, Gordon, and Meyer.

The "Subject:" field from the ARPA-Mail header will also be used as the subject in the Telemail header, when the message is forwarded.

Example 3-----

To: Intermail@INTERMAIL.ISI.EDU

Subject: Test Message Number 3

Forward: TELEMAIL

To: Worth/XYZ-INC,[Gordon/OMNET]MAIL/USA,  
[Meyer/Dept5/Div2/ABC-CO]MAIL/USA

Folks,

This is a test of mail forwarding.

--Fred

-----  
Acknowledgments: Thanks to Annette DeSchon, Jon Postel, and Craig E. Ward for their work on previous editions and their suggestions for this edition of these instructions.

**In case of questions or problems please send a message to:**

**Intermail-Request@INTERMAIL.ISI.EDU**

## APPENDIX E

DIALCOM

Ann Westine  
ISI  
March 1990

### MAIL FORWARDING BETWEEN DIALCOM AND THE INTERNET USING COMMERCIAL MAIL RELAY (CMR)

#### OVERVIEW

These are the instructions for using the Commercial Mail Relay (CMR) system that has replaced the Intermail system. The CMR is used for transmitting computer mail between the Internet ARPA-Mail system and users of three DIALCOM systems, COMPMAIL, NSFMAIL, and USDAMAIL. The CMR may be used in either direction.

\*\*\*\*\*

Please note: The use of DARPA-supported facilities is for DARPA-sponsored research activities and other approved government business.

\*\*\*\*\*

The CMR supports relay-style addressing in the Internet-to-Commercial-system direction, as well as Simple Forwarding in both directions.

Messages to be forwarded are sent to the CMR mailbox on the local mail system. The CMR operates a program to service mailboxes in both the local and the destination mail systems. When the right forwarding information is supplied, either in the ARPA-Mail header "To:" field, or at the beginning of a message, the program forwards those messages to the other mail system and on to the appropriate mailbox(es).

The CMR mailbox is called "INTERMAIL@INTERMAIL.ISI.EDU" on ARPA-Mail and "INTERMAIL" on the Dialcom systems. For example:

INTERMAIL:	=	Account	CMP0817	System	134
INTERMAIL:	=	Account	NSF153	System	157
INTERMAIL:	=	Account	AGS9999	System	157

Internet Relay-Style addressing is supported in the Internet-to-Commercial-Mail direction only. Type the Dialcom systems address in the "To:" field of the Internet header.

To: dialcom\_account%commercial\_mailer@intermail.isi.edu

The CMR supports Simple Forwarding in both directions. Use the following form:

Forward: <mail system>

To: <user mailbox>

<blank line>

When forwarding mail to the ARPA-Mail system, you may use any acceptable Internet address (user@host.domain) in the "To:" field. If you are sending mail to more than one recipient, separate the addresses by commas. It is also possible to include "cc:" recipients (See example 1, below).

When using Simple Forwarding to send a message from the Internet to a Dialcom system, you must use an acceptable name or account in the "To:" field. If you are sending a message to more than one Dialcom recipient, separate the addresses by commas.

In either direction, the local "Subject:" field of the message to the CMR is used as the "Subject:" field of the message delivered to the other mail system.



## DIALCOM TO ARPA-MAIL

The following is an example of how to send a message to "Intermail-Request", our user-service mailbox, with copies going to John on BITNET and Fred on UUCP. First send a message to the CMR mailbox called INTERMAIL. Then, in the body of the message text, add the forwarding information. A typical Internet address is in the form (user@host.domain). Addresses are separated by commas (spaces are not sufficient). Note: when sending mail to BITNET or UUCP, you must type "Forward: ARPA", not "Forward: BITNET" or "Forward: UUCP".

Example 1-----

To: INTERMAIL

Subject: Test Message Number 1

Forward: ARPA

To: Intermail-Request@INTERMAIL.ISI.EDU

Cc: JOHN%ABC.BITNET@CUNYVM.CUNY.EDU,bar!fred@UUNET.UU.NET

Chloe,

This is the text of the test message.

--Fred

-----  
"Forward: ARPA" signals the beginning of the forwarding information and tells the forwarding program that this message should be sent to the ARPA-Internet system. On the next line, "To: Intermail-Request@INTERMAIL.ISI.EDU" specifies the mailbox that the message will be delivered to. The "To:" line is required for delivery of the message.

Note that in the forwarding information section, the "To:" and "Cc:" fields must start at the beginning of the line. Continuation lines of the "To:" and "Cc:" fields, must be indented. The "To:" and "Cc:" fields may contain any message that ARPA-Mail allows. A blank line separates the forwarding information from the rest of the text. Therefore, do not insert any blank lines between the "Forward:" line and the "To:" line. The "Subject:" field from the Dialcom header will also be used as the subject in the ARPA-Mail header, when the message is forwarded.

NOTE: ARPA-Mail mailbox addresses, such as "Holg@ISI.EDU", contain the character "@", which is unfortunately also the default line-delete character on Dialcom systems. Therefore, it necessary for Dialcom users to change the line-delete character to another character that won't be used in the message, for example, Control-X (^X).

To do so, use the command: "TERM -KILL ^X".

This command should be used each time you login to Dialcom, after the ">" prompt.

Regular users may wish to edit their PARAM.INI file to include a command to make this change automatically when they login to Dialcom. To do this add "-KILL ^X" to the end of an existing TERM command, or add the line "TERM NONE -KILL ^X" to the file.

#### **SENDING FROM DIALCOM SYSTEM 134 or 157**

Because of the way the Dialcom system handles addressing, it is possible that the name "INTERMAIL" will not be recognized as a valid address if the sending user's login id begins with letters other than "CMP" on COMPMAIL, "NSF" on NSFMAIL, or "AGS" on USDAMAIL. However, Intermail's addresses "CMP0817", "NSF153", and "AGS9999" should work for any user, even if the "INTERMAIL" address fails.

#### **SENDING FROM DIALCOM SYSTEMS OTHER THAN 134, or 157:**

The name "INTERMAIL" will not be recognized as a valid address; use "134:CMP0817" or "157:NSF153" or "157:AGS9999" instead.

#### **SENDING TO BITNET, OR UUCP NETWORKS:**

BITNET and UUCP are networks with mail systems that are (semi) compatible with the Internet. They (and other networks) are connected to the Internet by host computers called mail gateways. To send mail to someone on one of these networks, you must know the recipient's electronic address and also the name of the host that acts as a gateway between that network and the Internet. For example, to send a message to John at ABC host on BITNET, you must send it via the BITNET gateway CUNYVM.CUNY.EDU. NOTE: You must modify the BITNET address when you use a gateway; replace the "@" sign in the BITNET address with "%". The correct address is shown below:

JOHN%ABC.BITNET@CUNYVM.CUNY.EDU

To send a message to fred at BAR host on UUCP, send it via the UUCP gateway UUNET.UU.NET. The correct address is as follows:

bar!fred@UUNET.UU.NET

## ARPA-MAIL TO DIALCOM

In order for a message to be delivered from ARPA-Mail to a mailbox on COMPMail system 134, NSFMAIL system 157, or USDAMAIL system 157, you simply type the appropriate Dialcom mailbox in the "To:" field of the ARPA-Internet header. For example:

To: CMP5678%COMPMail@INTERMAIL.ISI.EDU

To: NSF765%NSFMAIL@INTERMAIL.ISI.EDU

To: AGS8765%USDAMail@INTERMAIL.ISI.EDU

The Simple Forwarding Header is another method for sending a message to a mailbox on one of the above systems as well as remote Dialcom systems. In this direction, the Internet user must first send mail to the CMR mailbox on the Internet, "Intermail@INTERMAIL.ISI.EDU". Next, add the Dialcom forwarding information at the beginning of the message. This information is in the form:

Forward: COMPMail

To: <user mailbox>

<blank line>

Forward: NSFMAIL

To: <user mailbox>

<blank line>

Forward: USDAMail

To: <user mailbox>

<blank line>

A Dialcom address might include a list of names or accounts separated by commas. The "Subject:" field from the ARPA-Mail header will be used as the subject in the Dialcom header, when the message is forwarded.

In the following example, copies of the message are sent to six mailboxes, (F.Washington, the mailbox of account CMP1234, J.Smith, the account DEF0123, the account ABC678 on Dialcom system 5005, and K.Gordon). Some mailboxes are directly on COMPMAIL, others are on system 134 but not on COMPMAIL, and one is on a remote DIALCOM system. The Simple Forwarding Header method is used. Note that in the forwarding information section, the "To" field must start at the beginning of the line. Continuation lines of the "To:" field, must be indented, and addresses must be separated by commas (not spaces). Commands are not allowed in the address string of the "To:" field. (An example of a command not allowed would be a "Cc".)

Example 2-----

To: Intermail@INTERMAIL.ISI.EDU  
Subject: Test Message Number 2

Forward: COMPMAIL

To: F.Washington,CMP1234,J.Smith,  
DEF0123,5005:ABC678,K.Gordon

Fred,

This is a test of mail forwarding.

--Joe

---

## SENDING TO REMOTE DIALCOM SYSTEMS

Mailboxes on Remote Dialcom systems (such as "5005:ABC678") must use the combination domain and system number (See Appendix 1). Dialcom uses the colon as the delimiter between host and mailbox. The colon is a special character in the Internet standard and it must be quoted. The host "INTERMAIL.ISI.EDU" accepts the quoted colons, but many other Internet mail programs cannot handle the colons. We recommend using the Simple Forwarding Header when sending mail to remote system. See the explanations below for each system.

**COMPMAIL:** You may use a person's name as an address ONLY for people who are directly on Dialcom system 134, who are part of the COMPMAIL group (accounts that start with "CMP"). For people on Dialcom system 134 who are NOT in the COMPMAIL, group use the account number, for example, "DEF0123". To send to a Dialcom system other than "134", use the combination domain and system number and account number form of mailbox, for example, host "5005:ABC678". User names like "5005:J.Smith" will not work.

**NSFMAIL:** You may use a person's name as an address ONLY for people who are directly on Dialcom system 157, who are part of the NSFMAIL group (accounts that start with "NSF"). For people on Dialcom system 157 who are NOT in the NSFMAIL group, use the account number, for example, "DEF0123". To send to a Dialcom system other than "157", use the combination domain and system number and account number form of mailbox for example, host "5005:ABC678". User names like "5005:J.Smith" will not work.

**USDAMAIL:** You may use a person's name as an address ONLY for people who are directly on Dialcom system 157, who are part of the USDAMAIL group (accounts that start with "AGS"). For people on Dialcom system 157 who are NOT in the USDAMAIL group, use the account number, for example, "DEF0123". To send to a Dialcom system other than "157", use the combination domain and system number and account number form of mailbox, for example, host "5005:ABC678". User names like "5005:J.Smith" will not work.

#### **Data Transparency Limitations**

When mail is forwarded from ARPA-Mail to Dialcom, a "dot" character "." in column one (the leftmost space on the screen) cannot be transmitted, because it would be interpreted as a local command by the Dialcom system. Therefore, the Intermail program inserts a "space" before each "." that occurs in column one. "nroff" files in particular are affected.

In addition, since most control characters are not accepted by the Dialcom system, they should not be included in a message that is to be forwarded from ARPA-Mail to Dialcom.

**Acknowledgments:** Thanks to Annette DeSchon, Jon Postel, and Craig Ward for their work on previous editions and their suggestions for this edition of these instructions.

**In case of questions or problems please send a message to:**

**Intermail-Request@INTERMAIL.ISI.EDU**

## SERVICE NAME LIST

Dialcom services are also publicly offered in the following countries and to the following systems:

Service Name	Country	Domain Number	System Number
Keylink-Dialcom	Australia	60	07,08,09
Dialcom	Canada	20	20,21,22,23,24
DPT Databoks	Denmark	124	71
Telebox	Finland	127	62
Telebox	Germany (West)	30	15,16
Dialcom	Hong Kong	80	88,89
Eirmail	Ireland	100	74
Goldnet	Israel	50	05,06
Mastermail	Italy	130	65,67
Mastermail	Italy	1	66,68
Dialcom	Japan	70	13,14
Dialcom	Korea	1	52
Telecom Gold	Malta	100	75
Dialcom	Mexico	1	52
Memocom	Netherlands	124	27,28,29
Memocom	Netherlands	1	55
Starnet	New Zealand	64	01,02
Dialcom	Puerto Rico	58	25
Telebox	Singapore	88	10,11,12
Dialcom	Taiwan	1	52
Telecom Gold	United Kingdom	100	01,04,17,80-89
Dialcom	USA	1	29,30,31,32,33,34, 37,38,41,42,43,44, 45,46,47,48,49,50-59, 61,62,63,90-99

## APPENDIX F

MCI MAIL

Ann Westine

ISI

March 1990

### MAIL FORWARDING BETWEEN MCI MAIL AND THE INTERNET USING COMMERCIAL MAIL RELAY (CMR)

#### OVERVIEW

These are the instructions for using the Intermail system to transmit computer mail between users in the MCI Mail system and the ARPA-Mail system. The Intermail system may be used in either direction.

\*\*\*\*\*

Please note: The use of DARPA-supported facilities is for DARPA-sponsored research activities and other approved government business.

\*\*\*\*\*

Messages to be forwarded from one system to the other are sent to the "Intermail" mailbox on the local mail system. The Intermail system operates a program that services mailboxes in both the local and the destination mail systems. When the right information is supplied at the beginning of a message, the program forwards that message to the other mail system and on to the appropriate mailbox(es).

The Intermail mailbox is called "INTERMAIL@ISI.EDU" on ARPA-Mail and "INTERMAIL" (actually MCI-ID "107-8239") on MCI Mail.

To send a message to a mailbox on another mail system, you must include forwarding information at the beginning of the text of the message. This forwarding information tells the Intermail program which mail system to forward the message to, and which mailboxes to send it to. Type the forwarding information in the following form:

Forward: <mail system>  
To: <user mailbox>  
<blank line>

The syntax of the "To:" line must be acceptable to the system that will receive the message. For example, in MCI Mail, each addressee must be listed on a

separate line. In ARPA-Mail, the proper syntax is a list of mailboxes (user@host) separated by commas. It is also possible to include a list of "Cc:" recipients in either mail system. See the examples for further details.

In either direction, the local "Subject:" field of the message to Intermail is used as the "Subject:" field of the message delivered to the other mail system.

#### **MCI MAIL TO ARPA-MAIL**

The following is an example of how to send a message from MCI Mail to "Intermail-Request", our user service mailbox on the Internet, with copies going to John on BITNET and Fred on UUCP. Addresses are separated by commas (spaces are not sufficient). Note: when sending mail to BITNET or UUCP, you must type "Forward: ARPA", not "Forward: BITNET" or "Forward: UUCP".

Example 1-----

To: INTERMAIL

Subject: Test Message Number 1

Forward: ARPA

To: Intermail-Request@INTERMAIL.ISI.EDU

Cc: JOHN%ABC.BITNET@CUNYVM.CUNY.EDU,  
bar!fred@UUNET.UU.NET

Hi Chloe,

This is the text of the test message.

--Fred

-----  
"Forward: ARPA" signals the beginning of the forwarding information and tells the forwarding program that this message should be sent to the ARPA-Mail system. On the next line,

"To:Intermail-Request@INTERMAIL.ISI.EDU" specifies the mailbox that the message will be delivered to. The "To:" line is required, for delivery of the message.

Note that in the forwarding information section, the "To:" and "Cc:" fields must start at the beginning of the line. Continuation lines of the "To:" and "Cc:" fields must be indented. The "To:" and "Cc:" fields may contain any address that ARPA-Mail allows. A blank line separates the forwarding



information from the rest of the text. Therefore, do not insert any blank lines between the "Forward:" line and the "To:" line. The "Subject:" field from the MCI Mail header will also be used as the subject in the ARPA-Mail header, when the message is forwarded.

## **SENDING MAIL TO BITNET OR UUCP NETWORKS**

BITNET and UUCP are networks with mail systems that are (semi) compatible with the Internet. They (and other networks) are connected to the Internet by host computers called mail gateways. To send mail to someone on one of these networks, you must know the recipient's electronic address and also the name of the host that acts as a gateway between that network and the Internet. For example, to send a message to John at ABC host on BITNET, you must send it via the BITNET gateway CUNYVM.CUNY.EDU. Note: You must modify the BITNET address when you use a gateway; replace the "@" sign in the BITNET address with "%". The correct address is shown below:

**JOHN%ABC.BITNET@CUNYVM.CUNY.EDU**

To send a message to fred at BAR host on UUCP, send it via the UUCP gateway UUNET.UU.NET. The correct address is as follows:

**bar!fred@UUNET.UU.NET**

## **ARPA-MAIL TO MCI MAIL**

In this direction, the Internet user must first send mail to the Intermail mailbox on the Internet, "INTERMAIL@ISI.EDU". Next, add the MCI Mail forwarding information at the beginning of the text of the message. This information is in the form:

**Forward: MCI-MAIL**  
**To: <a valid MCI-Mail address>**  
**<blank line>**

While an interactive user of MCI Mail may give a person's name and interactively select which mailbox is the right one, the mail forwarding program must be supplied with a unique mailbox designator. Although, the only form of mailbox designator guaranteed unique in

MCI-Mail is the MCI-ID number, a name that is unique may also be used. Please note: Intermail cannot send mail to users on EMS, MCI "Offnet Registration", or Compuserve. The only acceptable type of address in the MCI "To:" or "From:" field is a "regular MCI account number".

The "Subject:" field from the ARPA-Mail header will be used as the subject in the MCI Mail header, when the message is forwarded.

The following is an example of how to send a message from the Internet to both "FWashington" and the mailbox of MCI-ID 123-1234, with copies going to three mailboxes (KGordon, AZyzzx, and MCI-ID 321-4321). Note that each addressee in the "To:" and "Cc:" fields must start at the beginning of the line and appear on a separate line.

Example 2-----

To: Intermail@ISI.EDU  
Subject: Test Message Number 2

Forward: MCI-MAIL  
To: FWashington  
To: 123-1234  
Cc: KGordon  
Cc: AZyzzx  
Cc: 321-4321

Fred,

This is a test of mail forwarding.

--Joe

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Acknowledgments: Thanks to Annette DeSchon, Jon Postel, and Craig E. Ward for their work on previous editions and their suggestions for this edition of these instructions.

In case of questions or problems, please send a message to:

**Intermail-Request@INTERMAIL.ISI.EDU.**